

1.7 - Solving Absolute Value Equations

Absolute Value: the distance the number is from zero on a number line.

Solving an Absolute Value Equation

The absolute value equation $|ax+b| = c$, where $c > 0$, is equivalent to the compound statement:

$$ax + b = c \text{ or } ax + b = -c$$

Ex 1: Solve $|2x - 5| = 9$

$$\begin{array}{r|l} 2x-5 & 9 \\ +5 & +5 \\ \hline 2x & 14 \\ \hline x & 7 \end{array} \quad \text{or} \quad \begin{array}{r|l} 2x-5 & -9 \\ +5 & +5 \\ \hline 2x & -4 \\ \hline x & -2 \end{array}$$

$$x = 7 \quad \text{or} \quad x = -2$$

Ex 2: Solve $|20 - 7x| = 2$

$$\begin{array}{rcl} 20 - 7x = 2 & \text{or} & 20 - 7x = -2 \\ -20 & & -20 \\ \hline \end{array}$$

$$\begin{array}{r} -7x = -18 \\ \hline -7 \end{array}$$

$$\begin{array}{r} -7x = -22 \\ \hline -7 \end{array}$$

$$x = \frac{18}{7} \quad \text{or} \quad x = \frac{22}{7}$$

Ex 3: Solve $|\frac{1}{4}x + 5| = 21$

$$\begin{array}{rcl} \frac{1}{4}x + 5 & \neq & 21 \\ -5 & | & -5 \\ \hline (4) \frac{1}{4}x & = & 16 \end{array} \quad \text{or} \quad \begin{array}{rcl} \frac{1}{4}x + 5 & \neq & -21 \\ -5 & | & -5 \\ \hline (4) \frac{1}{4}x & = & -26 \end{array}$$

$$x = 64 \quad \text{or}$$

$$x = -104$$

Homework: p.53 #17-25, 32-40